SHORTER NOTES

Relation of Sunshine to the Habitat of *Rottboellia exaltata* (Poaceae)—In the Philippine Islands *Rottboellia exaltata* is a good example of a plant, which although relatively intolerant, does not long survive full sunshine. Because it grows throughout the year, the consequences of this relation become conspicuous at certain seasons. At the borders of woodlands and in the edges of thickets *Rottboellia* grows luxuriantly all the year round. Within woods and thickets however it is not present. *Rottboellia* is a weed common to corn and rice fields. When the land lies after the harvest, *Rottboellia* frequently becomes entirely dominant. This takes place in the latter part of the rainy season when there is a high percentage of cloudiness. The luxuriant growth reaches an average height of six feet in the open but at the edge of woods it is somewhat higher and more spindling.

As the amount of sunlight increases with the approaching dry season, a great change takes place. Gradually the grass growing in the full sun dries up and falls over, resulting in the reduction of the height of the vegetation from that of *Rottboellia* (6 feet) to that of the plants heretofore growing beneath it, for example, *Mimosa pudica* (1 foot). Meanwhile plants of *Rottboellia* in the partial shade of the edge of thickets continue to develop and flower throughout the dry season. If, however, the partial shade be removed, the *Rottboellia* plants dry up and fall over.

Thus we have in *Rottboellia exaltata* an example of a plant whose habitat in the dry season is restricted to partial shade on account of its inability to withstand full sunshine.

F. C. Gates.

Douglas Lake, Michigan,
August, 1915.

REVIEWS

Dixon's Transpiration and the Ascent of Sap in Plants*

For over seventeen years botanists have been familiar with Prof. Dixon's papers, embodying the results of his scholarly investigations on the subject of transpiration and the ascent of

* Dixon, Henry H. Transpiration and the ascent of sap in plants. pp. i-vi and 1–216. figs. 1–30. Macmillan & Co. London, 1914. $1.40 net.

sap. The present book will be cordially welcomed as it brings together in one place a concise review of the literature and a clear statement of the present status of one of the most difficult subjects in plant physics.

Referring to the earlier writings, which, almost as a foregone conclusion, assigned the ascent of sap to "vital force," as now chiefly of historic interest, the present monograph gives an account "of a physical explanation of the rise of water in trees. This theory rests on a knowledge of a property of liquids, which, although discovered in the middle of the last century, was little recognized and seldom referred to in physical literature. It now appears that a full appreciation of this property is essential for a realization of the manner in which water is raised in plants and of the meaning of the structure of trees as a mechanism for lifting water." This property of liquids is cohesion.

The first chapter, on "The nature of transpiration," supports the thesis that the process of transpiration is not a purely physical one, but involves the important vital activity of secretion. This contention is supported by experimental evidence on the transpiration of living and dead leaves, and on transpiration in saturated spaces. The experiments demonstrate that the elevating force is largely, if not wholly, confined to living leaves, and that it is not evaporation but secretion.

The next and following chapters are devoted successively, to a criticism of the physical theories, a criticism of the vital theories, the cohesion theory of the ascent of sap in stems (the author's theory, the tensile strength of the sap in trees, estimate of the tension required to raise the sap, osmotic pressures of leaf-cells, the thermo-electric method of cryoscopy, methods of extracting sap for cyroscopic observations, osmotic pressures in plants, and the energy available for raising the sap.

To summarize, the author claims to have demonstrated that, "The transpiration stream is raised by secretory actions taking place in the leaf-cells, or by evaporation and capillarity (imbibition) at their surfaces, drawing water from the trachae. The state of saturation surrounding these cells determines which of these agencies is effective."

It is shown that the water in the vascular bundles in the stems of tall trees, when not subjected to pressure upwards from below, must be in a state of tension. "Therefore when root pressure is not acting and when the leaves of trees are transpiring, the cohesion of their sap explains fully the transmission of the tension downwards, and consequently explains the rise of the sap." For example, in a tree 100 meters high there results a tension of 20 atmospheres, but the cohesion of sap has been experimentally shown to be at least 200 atmospheres; therefore it "is in no way taxed by this tension."

The author finally points out that, in such tall trees, the osmotic pressure, necessary to keep the cells in the mesophyll turgid, must equal in magnitude the tensions necessary to raise the sap; and that "the stored energy set free by respiration in leaves is quite sufficient to do the work of secretion against the resistance of the transpiration stream; while, when the vapor pressure of water in the surrounding space is low, and when evaporation is doing the work of raising the sap, the expenditure of energy in this process will reduce the quantity of water evaporated only by an imperceptible amount."

C. Stuart Gager.

NEWS ITEMS

Ernst Ule died on July 15 in Berlin-Lichterfelder after a short illness at the age of 61 years. He was known chiefly for his exploration of the Brazilian flora.

Professor T. D. A. Cockerell is anxious to get living material of *Helianthus*, from eastern and southern United States. Those who could collect such material will confer a favor by writing to Professor Cockerell at Boulder, Colorado.

Dr. H. S. Jackson, professor of botany and plant pathology at the Oregon Agricultural College, has accepted the position of chief in botany at Purdue University Experiment Station, beginning Sept. 1, 1915. He will be succeeded by H. P. Barss, formerly associate professor of botany and plant pathology at the Oregon Agricultural College and Experiment Station,